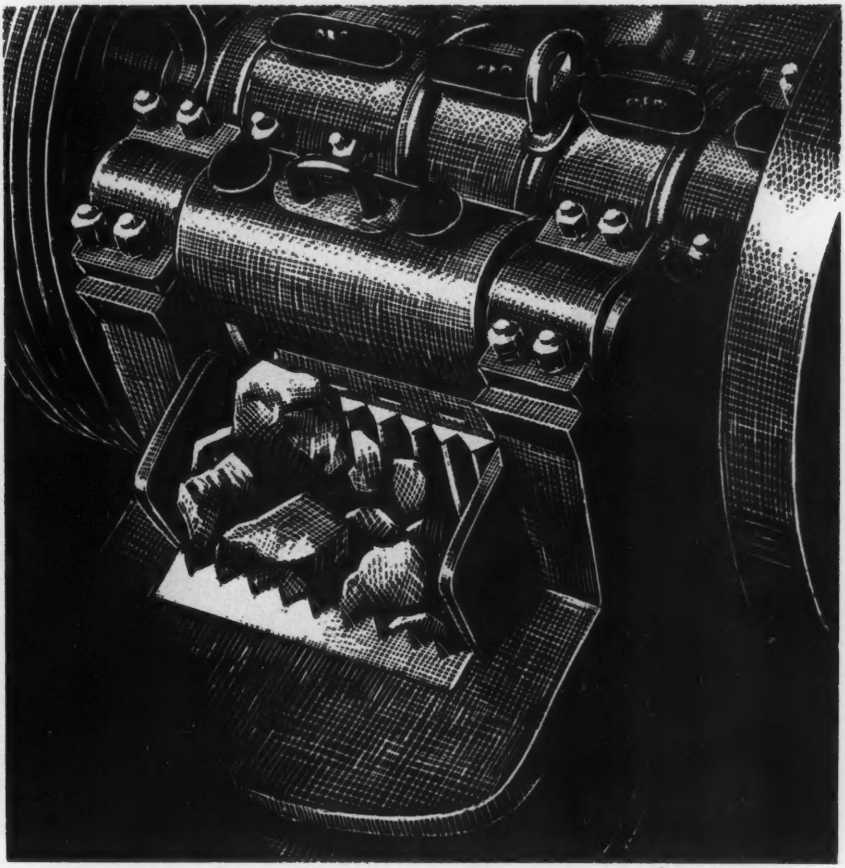
CEMENT AND LIME MANUFACTURE

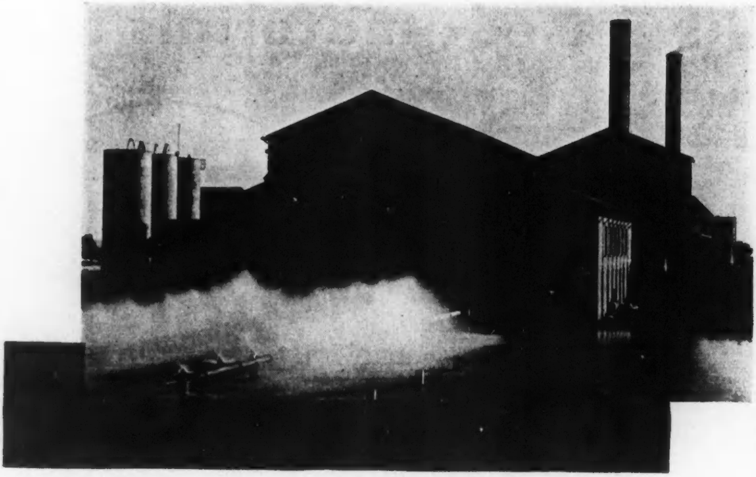
XXV. No. 4 — JULY 1952 — Price 1s. Annual subscription 6s. ($1.30 in Canada and U.S.A.)

PUBLISHED BY CONCRETE PUBLICATIONS LTD. 14, DARTMOUTH STREET, LONDON, S.W.1




ACTARC
WELDING EQUIPMENT
MONTA
For light welding and repair work, ideal for the workshop. Dual welding range 15 - 200 amps. Low mains intake.
MEDIA
For general production work, dual range 25-300 amps. Provided with 2 tappings giving different open circuit voltages. Very stable arc.
INERT GAS WELDING TRANSFORMER
For welding by the Argon arc process. Plants are available in various capacities with maximum of 600 amps.
DIESEL DRIVEN PLANT
Welding range 20 - 300 amps. (200 amps. continuous). Powered by Armstrong Siddeley 20 h.p. 2 cyl. air cooled Diesel engine.
Electrodes
The ACTARC range covers the whole requirements of the Welding Industry. There are ACTARC rods for :
MILD STEEL
HARD SURFACING
ALUMINIUM
BRONZE
ALUMINIUM-BRONZE
STAINLESS STEEL
CAST IRON
including a new low hydrogen type for medium carbon and low alloyed steels. Special pipe-welding electrodes etc.
ACTARC
WELDING ELECTRODES
ARC MANUFACTURING CO. LTD.
ACTARC WORKS, GOLDHAWK ROAD, LONDON, W.12
Telephone: Shepherds Bush 1151

208 ARC



CEMENT AND LIME MANUFACTURE

PUBLISHED ALTERNATE MONTHS. PRICE 1/- A COPY. ANNUAL SUBSCRIPTION 6S. POST FREE. $1.30 IN CANADA AND U.S.A.

PUBLISHED BY
CONCRETE PUBLICATIONS LIMITED
14 DARTMOUTH STREET, LONDON, S.W.1.

TELEPHONE: WHITEHALL 4581.
TELEGRAPHIC ADDRESS:
CONCRETIUS, PARL, LONDON.

PUBLISHERS OF
"CONCRETE & CONSTRUCTIONAL ENGINEERING"
"CONCRETE BUILDING & CONCRETE PRODUCTS"
"CEMENT & LIME MANUFACTURE"
"THE CONCRETE YEAR BOOK"
"CONCRETE SERIES" BOOKS.

VOLUME XXV. NUMBER 4. JULY, 1952

Chilanga Cement Works, Northern Rhodesia.

BY M. C. BAKER
(of Henry Pooley, Consulting Engineers)

WITH the increasing need for Portland cement to meet large development schemes in Northern Rhodesia, the Government of Northern Rhodesia decided in 1948 to construct a cement works at Chilanga, eleven miles south of Lusaka, and Messrs. Henry Pooley were appointed consulting engineers. Near the site, to the south, there are large outcrops of hard blue crystalline limestone, with further reserves to the east in the area of Lilayi. Also adjacent, and to the north, is a large deposit of phyllite, which forms the argillaceous component of the cement. In 1948 operations commenced on the construction of a wet-process plant with an output of 50,000 tons per annum, complete with power plant. The general arrangement is shown in *Fig.* 1.

The design allowed for extensions to increase the output to 150,000 tons per annum. Production started in July, 1951, and has since been continuous. Due to the increasing demand the first order was placed in July, 1951, for machinery to increase the output of the plant to 150,000 tons per year. The additional machinery includes limestone-crushing plant, raw mills, pumps, and slurry storage-tanks, and additional cement mills and silos for rapid-hardening and ordinary Portland cement. The extension includes one additional kiln 256 ft. long and of greater diameter than the existing kiln. The extension of the power station provides for increasing the generating capacity to 7,500 kw. and for further increase if necessary

Raw Materials.

The limestone is quarried by compressed air drilling and blasting, and hand loaded into 3½ cu. yd. Muirhill dumpers for conveyance to the crushing plant a quarter of a mile from the quarry face.

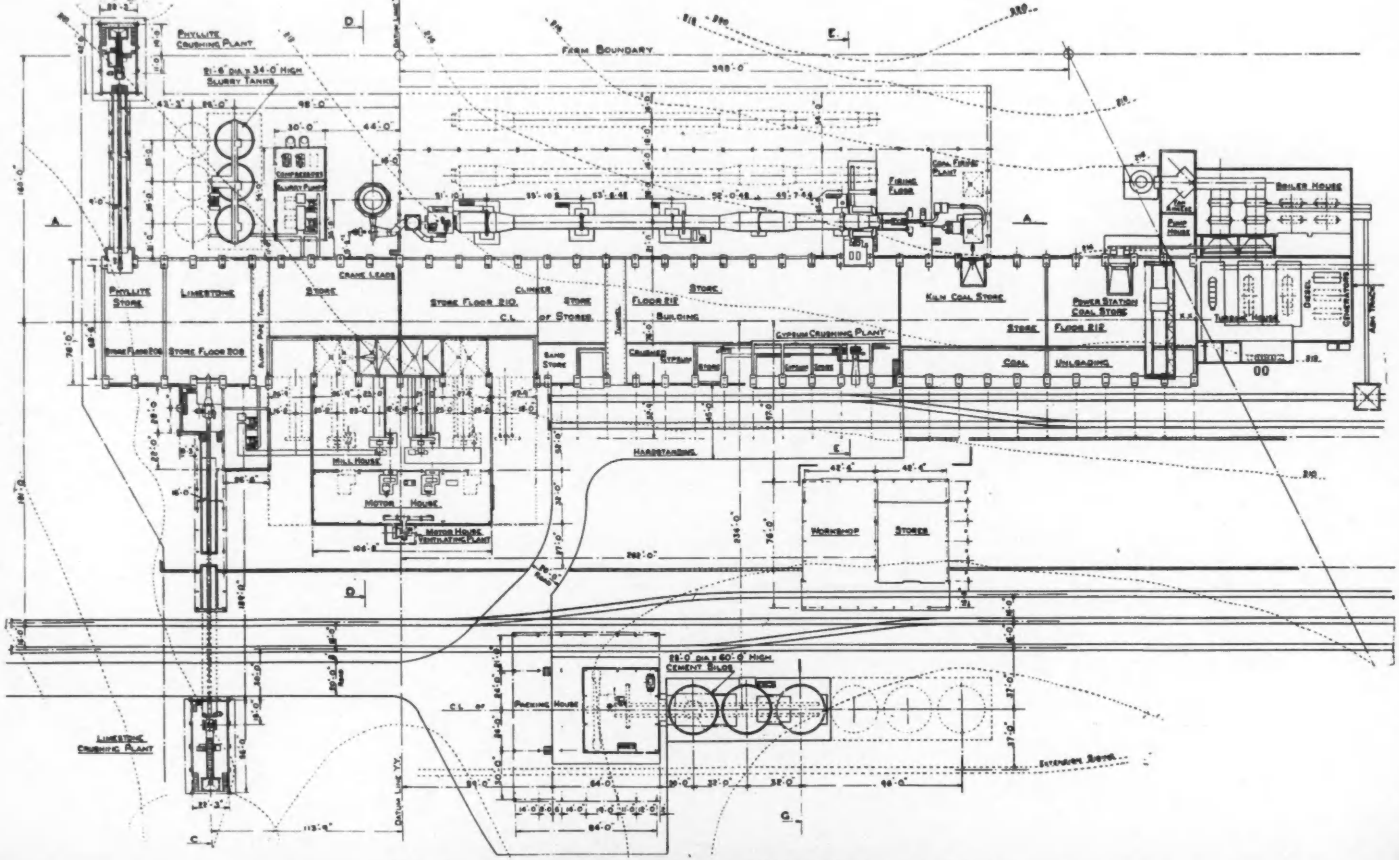


Fig. 1.—Plan of Chilanga Cement Works, Northern Rhodesia.

CRUSHING THE LIMESTONE.—The limestone is discharged from the dumpers into a hopper, from which it is fed by a variable-speed inclined apron-feeder to a 36-in. by 24-in. swing-jaw crusher driven by an 80-h.p. motor and capable of reducing 55 tons of stone per hour from 15-in. cube to 4-in. to 5-in. cube. The product is discharged to a 24-in. inclined troughed-band conveyor which takes it to the secondary crusher; this is a Fraser & Chalmers SXT-7-42 hammer-mill driven by a 110-h.p. motor, and reduces the stone to $\frac{3}{4}$ in. and smaller. From the hammer-mill, the stone is taken to the store by a 20-in. by 50-ft. vertical elevator. A sectional elevation of this plant is given in *Fig.* 3.

CRUSHING THE PHYLLITE.—The phyllite (an indurated clay) is quarried by hand, loaded into Muirhill dumpers, and discharged into a steel hopper in

Fig. 2.—Sub-station for Mill Motors.

the crushing building. A 24-in. wide inclined steel tray-conveyor feeds the phyllite to a Fraser & Chalmers SXT-5-42 hammer-mill, which is driven by a 60-h.p. motor and is capable of reducing 40 tons per hour from 6-in. cube to minus $\frac{3}{4}$ in. The material is discharged on to an 18-in. by 120-ft. inclined troughed-band conveyor which takes it to the store building.

MAIN STORE BUILDING.—The main store building is 647 ft. long, 76 ft. wide, and 57 ft. 6 in. high to the eaves. The reinforced concrete retaining walls are 12 ft. high with buttresses at 17 ft. 6 in. centres, on which are erected steel stanchions supporting the crane rail and roof. Storage is provided for 6,000 tons of crushed limestone, 3,000 tons of crushed phyllite, 11,500 tons of clinker, 1,500 tons of kiln coal, 1,500 tons of boiler coal, and 1,000 tons of gypsum. Provision is also made for the storage of 500 tons of silica sand. A $5\frac{1}{2}$-tons Arrol overhead crane travels the entire length of the store.

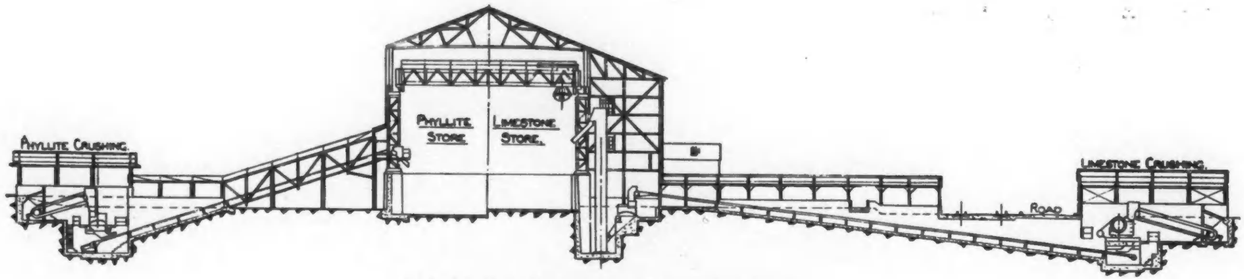


Fig. 3.—Section through Crushing Plant.

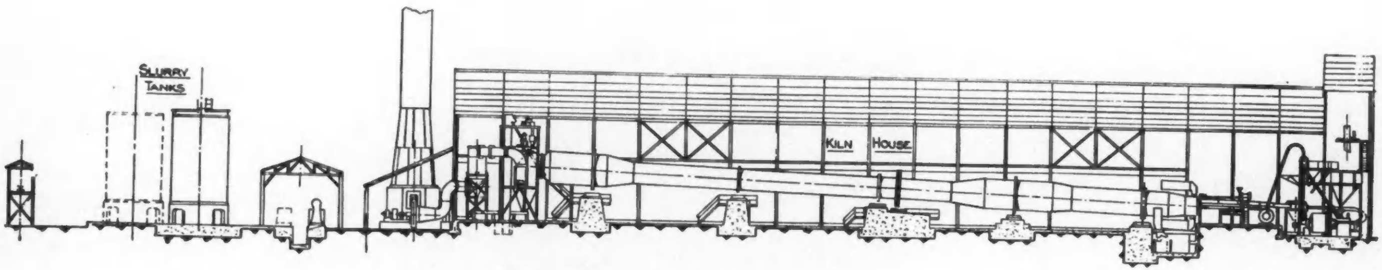


Fig. 4.—Section through Kiln House.

GRINDING RAW MATERIALS.—By means of the overhead crane, the crushed limestone and phyllite are transported to steel bunkers over the raw mill, to which they are fed by table-feeders; the bunkers have a third compartment with feed-table in case it should be necessary to add sand to the mixture for the manufacture of low-heat cement. The mill (supplied by Vickers-Armstrongs, Ltd.) is 6 ft. 6 in. in diameter and 40 ft. long, and is divided into three compartments. The first two chambers are lined with manganese stepped and corrugated plates respectively, and the third chamber is lined with chilled cast-iron bricks. The total charge of this mill is 36 tons, ranging from 4-in. carbon-steel balls to ½-in. steel

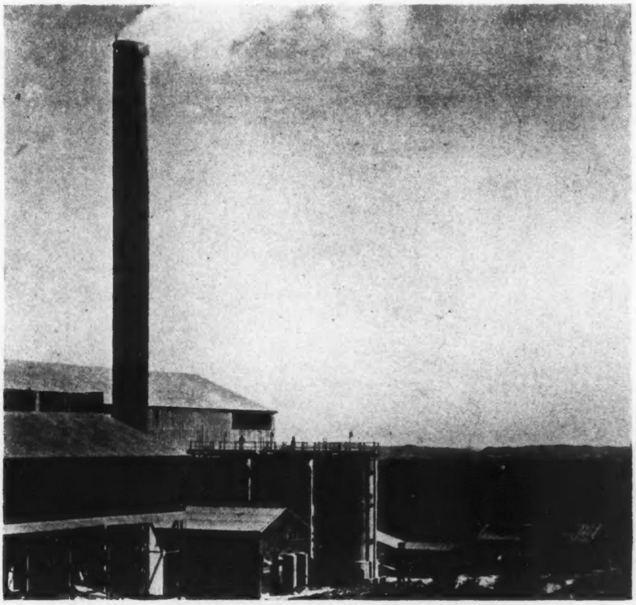


Fig. 5.—View from South-west.

Cylpebs. The mill, which rotates at 21·4 r.p.m., is fitted with a totally-enclosed girth gear-drive and is driven through a countershaft by a 500-h.p., 3,300-volt, Metropolitan-Vickers motor through a single-reduction double-helical gear supplied by Turbine Gears, Ltd. (*Fig.* 2). Both the main trunnion bearings are fitted with internal lighting, thus making it possible to inspect the lubrication without unsealing the bearing. The slurry discharged from the mill flows by gravity along a trough to a sump in the pump-house, in which are two Edgar Allen 8½-in. by 16-in. three-throw ram pumps (one as a standby) for transferring the slurry to tanks.

SLURRY MIXING AND BLENDING.—Three steel slurry tanks are installed for the first kiln. Each tank is 21 ft. 6 in. diameter and 34 ft. high (*Figs.* 5 and 8). Agita-

tion and mixing of slurry are by compressed air from two Reavell reciprocating two-stage vertical compressors (one as a standby), the air supply being regulated by a Reavell automatic air-distributing valve. The air-agitation pipes in each tank can be removed as required for cleaning. Grids fitted in each tank, 3 ft. from the bottom, support the lower ends of the air-pipes and facilitate positioning the pipes when they are replaced after cleaning. Slurry is drawn from the tanks by two valves at the base of each tank, and flows through 6-in. pipes to the kiln feed pump.

Rotary Kiln Plant.

The kiln (by Vickers-Armstrongs) is on the north-east side of the main stores. It is 254 ft. long and has a desiccator and patent recuperators (*Fig.* 6). The diameter at the desiccator is 12 ft., the main body being 7 ft. 9 in., the carbonating zone

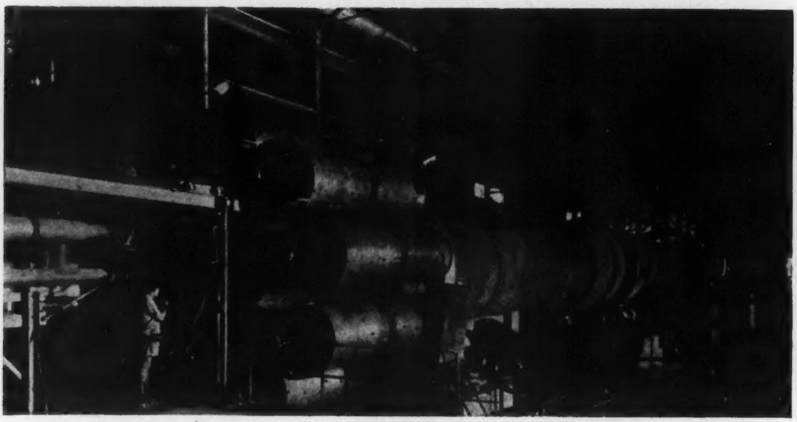


Fig. 6.—The Kiln.

11 ft., and the burning zone 9 ft. The kiln, of all-riveted construction, is carried on five tyres ; the supporting rollers are in rotating self-aligning totally-enclosed water-cooled bearings. The bearings are on cast-iron bedplates mounted on five concrete piers. Excessive downward thrust of the kiln is counteracted by rollers fitted to the third and fourth bedplates, and an additional roller is fitted to the third bedplate to counteract upward thrust. The kiln is driven by a 60-h.p. variable-speed motor through a totally-enclosed double-helical double-reduction gear supplied by Turbine Gears, Ltd., through a further gear on the drive bedplate, to the girth-gear fitted to the kiln by tangent plates. Lubrication of the girth-gear is by a light sprocket rotating in an oil-bath. Excess oil is removed by spring-loaded gunmetal scrapers fitted to the girth gear guard.

Slurry is supplied by two Edgar Allen three-throw ram pumps (one as a standby) and is fed to the kiln by a spoon-feeder driven by a variable-speed motor controlled from the firing floor. The overflow is returned to the feed-pump for recirculation.

The spoon-feeder and measuring pot are supported on a steel structure mounted over the back end-chamber, which is of steel and brick lined (*Fig. 7*). The damper is fitted with a motor-driven winch and is controlled by an " inching " button from the central panel on the firing platform. The gases from the kiln pass through the back end-chamber and are carried through a 4-ft. 6-in. steel duct to a Howden Vortex downflow dust-collector.

The induced-draught fan is a Davidson 91½-in. single-inlet narrow-width star-type fan driven by an 80-h.p. motor through a Vulcan-Sinclair hydraulic coupling which permits the speed of the fan to be varied from the firing floor or by a hand-wheel on the coupling. Waste gases are discharged to atmosphere through a steel chimney 150 ft. high by 10 ft. 9 in. diameter lined with firebrick. Dust recovered

Fig. 7.—Back-end of Kiln.

from the back end-chamber and the collector is transported by an 8-in. screw conveyor to an 8-in. vertical bucket-elevator which returns it to the kiln. The kiln hood is mounted on an adjustable supporting structure which enables it to be easily retracted when required.

Clinker from the recuperators falls on to a 20-in. by 45-ft. shaker-conveyor which takes it to two 16-in. by 48-ft. vertical bucket-elevators (one as a standby) discharging into the clinker store. The oversize lumps from the shaker-conveyor pass through 24-in. diameter crushing rolls.

The centralised kiln-control panel is mounted on the firing floor and comprises kiln speed and back-end temperature recorders, kiln and coal-plant draught-gauges,

spoon-feeder control, and control buttons for the kiln, the shaker-conveyor, and the elevators.

HANDLING AND CRUSHING COAL.—Firing is effected by a 47½-in. diameter Sirocco star-type fan driven by a 36-h.p. motor through a Vulcan-Sinclair hydraulic coupling. The hot air from the kiln passes first through a dust-collecting box between the kiln and the mill. Between the mill-discharge and the firing-fan is a 3-ft. 3-in. diameter classifier. The telescopic firing pipe is mounted on a travelling carriage with handwheel control. A sectional arrangement of the kiln house is illustrated on *Fig.* 4.

Coal is received by rail and is discharged by hand into pits. Kiln firing is by means of a Vickers direct-fired plant. The coal is discharged by the crane into a 40-tons hopper in the main stores building, from where it is fed by a 4-ft. 6-in. feedt-able to a 12-in. vertical bucket-elevator discharging into a 20-tons hopper

Fig. 8.—Cement Silos and Pneumatic Pipeline.

over the mill. Feed to the mill is by a 3-ft. diameter feed-table with enclosed chain-drive to a rotary air-seal.

The coal is ground in a 6-ft. 6-in. diameter by 7-ft. 6-in. air-swept mill divided into two compartments, the first (about 2 ft. 6 in. long) being lined with cast-steel step-liners and the second with cast-steel corrugated liners. The total charge is 6¾ tons, varying from 3-in. steel balls to 1-in. to 2-in. steel Cylpebs. The mill is supported on two 20-in. diameter water-cooled trunnion bearings and is fitted with a cast-steel spur-ring attached by tangent plates. The drive is by a 90-h.p. motor through a David Brown double-reduction double-helical gear.

Grinding Clinker.

The clinker and crushed gypsum are supplied to the cement mill by feed-tables from a two-compartment steel bunker adjacent to the raw-mill bunker. The

gypsum feed-table is 3 ft. 6 in. diameter and operated by rachet drive from the 4-ft. 6-in. diameter clinker feed-table. The cement mill is similar in all respects to the raw mill. Cooling of the mill shell is by means of a water-trough supported above the mill. Aspiration is by a Visco-Beth suction-type automatic dust-collector.

Transport and Storage of Cement.

Cement is conveyed from the mill to the silos through an overhead pipe (*Fig.* 8) by a 6-in. Fuller-Kinyon pump situated below the discharge screen from the mill. Fitted between the screen and the pump is a Fuller sampler, which provides means for constant sampling. There are three steel silos of riveted construction, two of 1,500 tons capacity each and the third, divided into six bins, of 1,200 tons capacity. The flow of cement can be diverted into any silo by Fuller-Kinyon two-way hand-operated valves. Fuller high-level indicators fitted to each

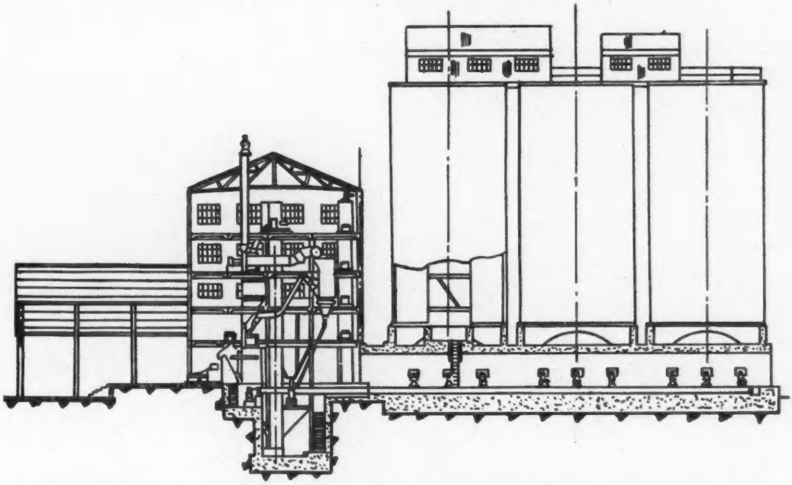


Fig. 9.—Section showing arrangement of Packing Plant and Cement Silos.

silo are connected to an indicator board and klaxon in the mill-motor house and give visual and audible warning when a silo is full.

Cement is drawn from the silos into two 18-in. diameter by 120 ft. screw-conveyors, the flow being controlled by Fuller rotary valves. The 18-in. conveyors are connected at their discharge end to a transverse screw-conveyor feeding an 18-in. wide by 58 ft. totally-enclosed dumper-type vertical elevator. From the elevator head the cement is discharged to a Darnley Taylor vibrating screen to remove any foreign matter before passing to the packer feed-hopper.

Packing Plant.

There is one Darnley Taylor Modern three-spout machine capable of packing 36 tons of cement per hour in 94-lb. bags. In addition to the packer feed-hopper,

there is also a 60-tons hopper which enables production to continue while the packing machine is not operating. Spillage from the packing machine is returned to the elevator. The filled bags fall automatically from the machine and are conveyed by a 24-in. reversible flat-band conveyor for loading into railway trucks or road vehicles. Facilities also exist for bulk loading into rail wagons.

The packing building (*Fig.* 9) is four stories high, with storage space for about 500,000 empty bags. A vertical elevator serving all floors facilitates the moving of the bags from wagons to the store or from the store to the packer as required. On

Fig. 10.—The Boiler House.

the second floor of the building is a Visco suction-type automatic dust-collector connected to the packing machine and silos. The scavenging-fan discharge is connected to a 48-kw. heater which prevents a crust forming in the filter stockings.

Gypsum Crushing Plant.

Rock gypsum is received by rail and is discharged by hand into a pit in the stores building, from which it is fed as required to a 20-in. by 10-in. roll jaw-

crusher. From the crusher the gypsum falls on to a 15-in. inclined belt-conveyor which takes it to the store.

Power Plant.

The power station adjoins the east end of the main stores building. The plant comprises two John Thompson 20,000 lb. per hour Beta-type water-tube boilers with a working pressure of 250 lb. per square inch (*Fig.* 10). The boilers are fitted with mechanical-grate stokers and Green's economisers. The arrangement of the boiler house allows for the installation of two additional boilers of the same capacity. Boiler feed-water is treated by a hot-process lime-soda softening plant.

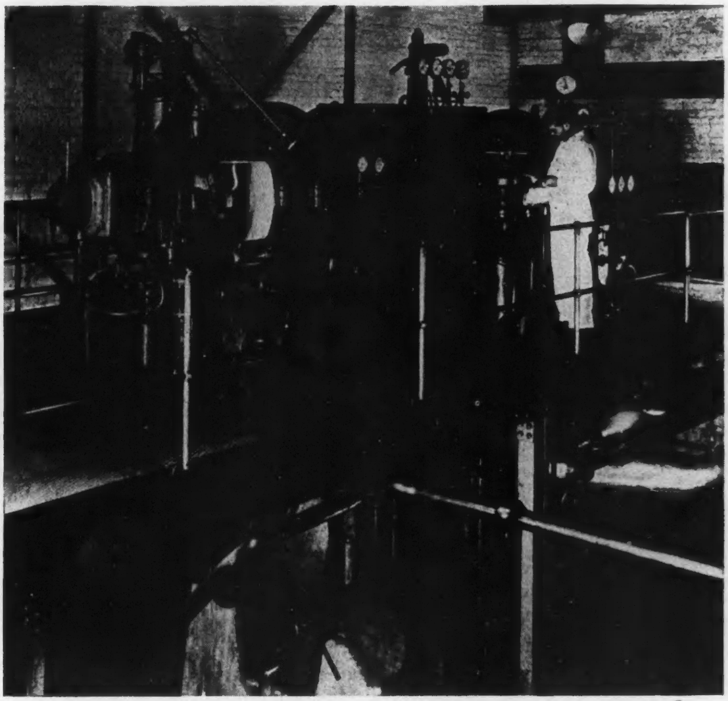


Fig. 11.—1,500-kw. Turbo-alternator.

Coal discharged by hand into the bunkers in the main stores building is conveyed by the crane to a 40-tons hopper, from which it is extracted by electrical vibrators feeding two vertical chain-bucket elevators. From the elevator the coal is transported by a flat-band conveyor to the boiler feed-bunkers. Power is generated at 3,300 volts, 3-phase, 50 cycles by a Brush-Ljungstrom 1,500-kw. steam turbo-alternator (*Fig.* 11). Cooling water for the condenser is from a spray pond adjacent to the power-house (*Fig.* 12). As a standby, a Petter-Brush 400-kw. diesel alternator is installed and is capable of operating the kiln and auxiliary plant

over week-ends or such other times as the turbine may be out of service. From the main high-tension switchboard, power is transmitted at 3,300 volts to the mill motor-house, in which is the main sub-station. This comprises the extra-high-tension and low-tension switchgear, and includes two 700-kva. transformers which reduce the voltage to 415/240, 3-phase, 50 cycles to provide for general distribution in the works and works lighting. Power at 3,300 volts is also supplied direct from the power-station to an overhead distribution system feeding the transformer stations at the housing sites and borehole-pump sites.

Extensions to the works include the supply of two further John Thompson 20,000 lb. per hour boilers and two Brush-Ljungstrom turbo-alternators. The in-

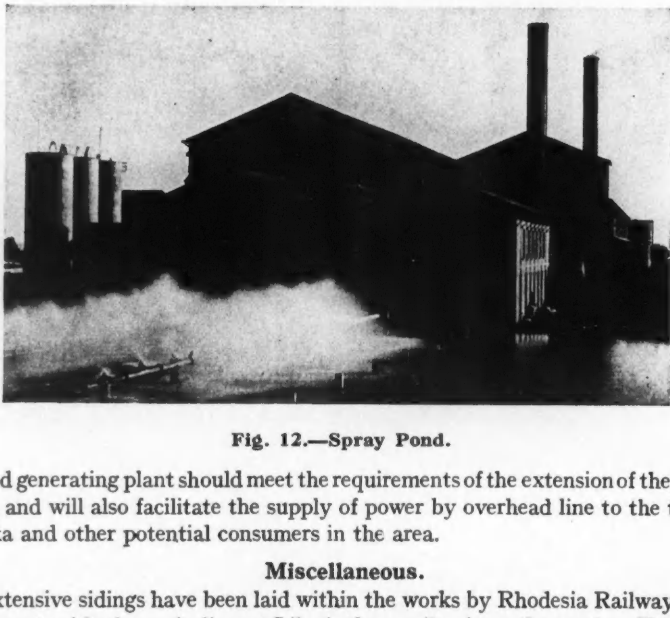


Fig. 12.—Spray Pond.

creased generating plant should meet the requirements of the extension of the cement plant, and will also facilitate the supply of power by overhead line to the town of Lusaka and other potential consumers in the area.

Miscellaneous.

Extensive sidings have been laid within the works by Rhodesia Railways, Ltd., to connect with the main line at Lilayi, three miles from the works. Haulage of coal, gypsum, and cement between the main line and the works, and shunting within the works area, is done by two Ruston & Hornsby 165 DS 0-6-0 diesel shunting locomotives. A 60-tons Avery tandem-rail weighbridge is installed for weighing incoming coal and gypsum.

Water is obtained from deep boreholes situated within a radius of 1½ miles of the works, and is pumped by two Sulzer vertical-spindle pumps and one Sumo submersible pump discharging through an 8-in. main to a 100,000-gallons Braithwaite steel tank erected on a hill to the north-east of the works. Water from bearings and cement-mill cooling is re-used for slurry grinding and for the spray pond.

The European staff is accommodated on a housing estate one mile to the south-west of the works. African employees are accommodated to the west of the works.

The Cement Industry in Great Britain.

THE following notes are taken from the statement of the Chairman, Mr. George F. Earle, C.B.E., at the annual general meeting, held last month, of the Associated Portland Cement Manufacturers, Ltd. Last year the Blue Circle group of companies delivered nearly 250,000 tons more cement than in their record year of 1950, while the industry as a whole for the first time delivered to the home and export markets over 10 million tons. So far this year the group's deliveries of cement were about 370,000 tons more than last year; the percentage increase was considerably greater in the export than in the home market, and it seemed reasonable to expect that their problems this year would be of production rather than of sales. They hoped during 1952 to produce over 7 million tons at their home works.

To meet the future demand they were concentrating on extending and increasing the efficiency of existing works rather than building completely new works in England. The cost of new works was now so high that it was practically impossible for them to compete with existing works unless the savings in transport were really large. The existing works stood in the Company's accounts at a value representing just over 14*s.* 6*d.* per ton of yearly output, whereas the cost of new works was about £8 per ton of yearly output. The new kiln at Hope works should be running later this year with a production of 170,000 tons. Masons works at Ipswich were being extended by 60,000 tons, while improvements made with comparatively small capital expenditure should increase the output from other works in England by about another 100,000 tons. A kiln from the Thames was being enlarged and re-erected, with ancillary equipment, in Northern Ireland, which, apart from the works at Magheramorne, was now supplied from the Thames. This would result in a considerable freight saving and would make Northern Ireland practically self-supporting in cement. An agreement was being made with the United Sulphuric Acid Corporation, Ltd., to purchase all the cement clinker they would produce at Widnes in the manufacture of sulphuric acid, and a grinding and packing plant would be built. The process of manufacture was well tried and produced clinker of excellent quality. The output would be about 140,000 tons per year. These plans would increase their output in Great Britain by about half a million tons.

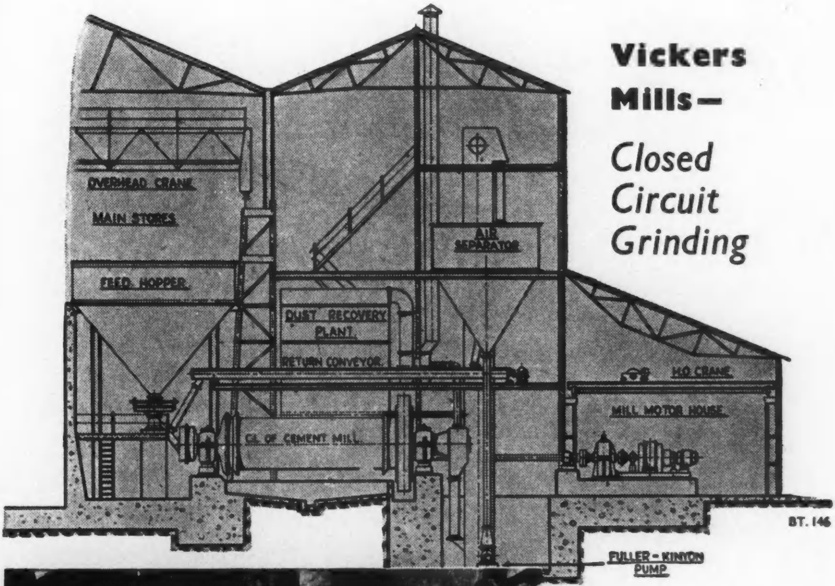
There was also a story of progress oversea by the companies in which they were interested. In Mexico they now made white cement, and were putting in another big kiln for ordinary Portland cement. In New Zealand a new kiln and other plant were being installed, a kiln was being erected in Australia, and in South Africa proposals for a new kiln were under consideration. In Nigeria a start was being made on the site, and in Malaya good progress was being made in the construction of new works. A new large kiln in British Columbia should be in operation this year.

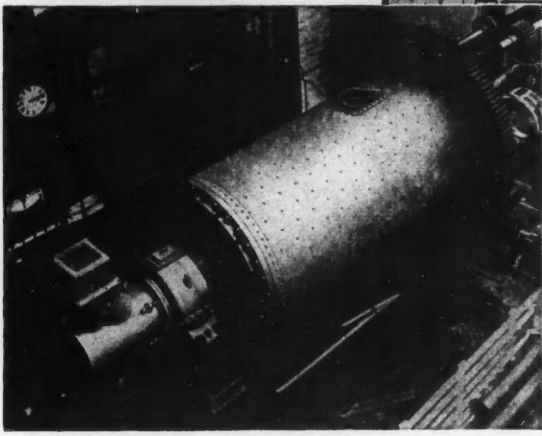
It was satisfactory that they had been able to finance all the schemes from their own resources and to pay their taxes as well. But for the export trade this would have been impossible. It was with the greatest regret that they learnt of

the imposition of the Excess Profits Levy and hoped that this additional charge on industry would soon be removed. If industry was to maintain and increase its production and efficiency it was essential that it should be in a position to keep its fixed assets up to date and to replace from its own resources those assets when worn out. With the existing high taxation and building costs it was extremely difficult to do this and, unless there was some relief, it would become impossible. The profits of the group last year, after providing for reserves, was £4,670,000, of which taxation took 83 per cent. Comparing 1951 with 1950, book debts less trade creditors were £1 million higher, while stocks and stores and spare parts were more than £2·3 millions higher; they had thus had to find £3·3 millions in cash for these two purposes. In this figure was included the stock of paper and paper bags, which increased by over £1·1 millions, a considerable part of which was due to the increased cost of paper. The price per ton of the paper mostly used had advanced from £15 14*s*. in 1938 to £158 12*s*. at 31 December, 1951—more than ten times. The price of cement had not even doubled in the same period, but unfortunately they had to include the price of paper bags in the price of cement, and this fantastic advance in the price of paper had a serious effect on the cost of building. He was glad to say that many customers now took cement in bulk and so helped the country by reducing the imports of paper and pulp. He hoped that many more would do this, and so save money for themselves as well.

The Ministry of Works had released the industry from control, and when this was done they undertook not to increase prices unless there were really serious increases in cost. Their reaction to this freedom had been that it was now their duty to do everything possible to get prices down. Although they had always been keen, for their own good, to keep prices low, the psychological effect of freedom from control was to make them even keener to do this. He believed that this was the reaction one could expect from all industrialists in these circumstances. The price of cement in England was still lower than anywhere else in the world. Production per man per week in 1951 was higher than in 1950, and over 34 per cent. higher than in 1935. Basic wage rates per hour had, however, increased at a greater rate than production per man.

Since the war much had been done to stir up class hatred, and the propaganda had been successful. Nothing could do our country more harm. There must be classes. Someone must lead. It was not usual for the members of a cricket team to regard their captain as an enemy; the politician or the managing director of a business was in a similar position to that of the captain of a cricket team. It was the duty of everyone to see that business and political leaders were the best men, mentally and morally, and that they were all working for the good of their country and their business, and not for themselves or their particular sect. Why was it that the theory of class hatred had taken such a hold? Communism had much to do with it. Many might never go to church, yet were deeply influenced by Christian ethics, and many people who were not communists were influenced by communist propaganda. Some of them could remember when the people of this


OVERHEAD CRANE
MAIN STORES
FEED HOPPER
DUST RECOVERY PLANT
RETURN CONVEYOR
AIR SEPARATOR
C.L. OF CEMENT MILL
H.O. CRANE
MILL MOTOR HOUSE
BT. 146
FULLER-KINYON PUMP



country pulled together happily, each appreciating that the others were doing their best in their own jobs, from the Prime Minister to the farm lad, each respecting the others. In those days the churches were full. Many, if not most, people felt that life consisted of more than material things and, what was more, they were not shy about saying so. Our greatest leaders felt that it was more important to consider the happiness of others than one's own. This was not only the secret of success, but also of personal happiness. This truth applied to business as well as to the pulpit. It was, to his mind, the only answer to communism.

The Soundness of Lime Putty.

A STUDY by Mr. Lansing S. Wells, Mr. Walter F. Clarke, and Mr. Ernest M. Levin on the potential unsoundness of regularly hydrated dolomitic limes is described in Building Materials and Structures Report No. 127, issued (price 15 cents) by the United States National Bureau of Standards, Washington, D.C. The authors state that these limes are potentially unsound because they contain unhydrated magnesia that may hydrate subsequently in the set plaster, causing disruptive expansion, and it is important to know the time required to soak these limes as putties so that sufficient magnesia will be hydrated to give a sound putty. The customary soaking period of one day is inadequate. In the investigation described, eighteen regularly hydrated dolomitic limes representative of commercial production were studied. The limes differed markedly in regard both to the time required to reach a given percentage of expansion and to the extent of hydration at the given expansion. The shortest time of ageing required to reduce the expansion to 1 per cent. (a suggested specification limit for soundness) was three weeks, whereas the longest time was in excess of 32 weeks. When the expansion had been reduced to 1 per cent., the proportion of total magnesia hydrated ranged from 83 to more than 97 per cent. Inasmuch as long and variable ageing periods are impractical, suitable alternatives, including the use of newly-developed sound hydrated limes, are discussed.

The tests showed that for any particular lime, as the percentage of magnesia hydrated in the putty increased, the percentage of autoclave expansion of corresponding 1 : 1 cement-lime putty bars decreased ; but neither the rate of increase of hydration nor the rate of decrease of expansion was a linear function of time. As the amount of magnesia hydrated approached 100 per cent., the autoclave expansion approached 0·2 to 0·3 per cent. In general, the lime putties requiring the longest periods to effect a reduction in expansion to one per cent. also gave the highest expansions for a given percentage of unhydrated MgO. The hydrated limes which gave expansion values of 14 per cent. or more when tested on the "as received" basis required fourteen weeks or more as a putty before the expansions were reduced to 1 per cent. The average percentages of total magnesia hydrated in the putties after ageing 1, 3, and 7 days were only 22·5, 29·2, and 41·1 respectively, and the corresponding average percentages of linear expansion of the cement-lime putty bars were 11, 10·6, and 9·7. It is difficult to specify the

period of ageing required to reduce the expansion to 1 per cent., because this might be from three weeks to over 32 weeks.

Some manufacturers are now producing a more completely hydrated dolomitic lime. In most instances this has been accomplished by using autoclaves to hydrate the lime at elevated temperature and pressure. Specifications have been formulated which state that the total free calcium oxide (CaO) and magnesium oxide (MgO) in the hydrated product shall not exceed 8 per cent. by weight (calculated on the "as received" basis); in the specifications of the American Society for Testing Materials such lime is designated as type S (special) hydrated lime. Although most high-calcium hydrated limes are not highly plastic, nevertheless, they are used for plastering and masonry construction. They are characterised by having low percentages of unhydrated oxides and low percentages of autoclave expansion, and, consequently, are eminently sound. Another alternative is quicklime, because a satisfactory lime putty that is completely hydrated can be obtained from quicklime.

Motors for Rotary Kilns.

IN a review of the methods of driving rotary kilns in "Zement-Kalk-Gips" for April 1952, H. G. Waeber expresses the view that 3-phase shunt-conduction electric motors are more efficient than the slip-ring induction types now commonly used.

Patents Relating to Cement.

Composition of Cement.

A cement consists of ground cement clinker containing at least 50 per cent. $3CaO.SiO_2$ mixed with a filler not so finely ground. At least 65 per cent. of the clinker is ground to less than 20μ, while the filler, for example sand, is ground so that less than 10 per cent. is larger than 0·2 mm. and not more than 20 per cent. is smaller than 20μ. The cement and filler are ground separately and are mixed in the proportions of 80-85 per cent. clinker to 20-50 per cent. filler.—No. 624,463.—F. L. Smidth & Co. Aktieselskabet. November 1946.

Non-Shrinking Cement.

In order to counteract the shrinkage of Portland cement during setting, there is added a dry unburnt mixture of calcium sulphate, calcium hydroxide, and a reactive compound of aluminium so that on addition of the gauging-water a sulpho-aluminate with a high content of water of crystallisation is formed. The formation of the sulphur-aluminate is facilitated and the amount of gauging-water is reduced by the addition of 0·01-0·5 per cent. of an organic hydroxy acid. One of the constituents of the mixture, for example, the aluminium compound,

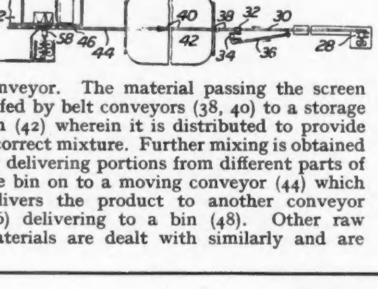
can be absorbed by gels or surface-active finely-powdered inorganic substances such as silica gel, trass, or the like. The calcium hydroxide and sulphate may be added in a dry condition, while the aluminium compound may be incorporated in suspension in the gauging-water.—625,738.—K. Winkler and F. Schenker. July 1946.

Composition of Slurry.

In order to reduce the amount of water used in the slurry of raw materials in the wet process of cement manufacture, there is added the product obtained by treating peat or boggy soil with concentrated alkali solution and allowing the mixture to stand in contact with the air for some days.—626,175.—J. Rutle. May 1947.

Manufacturing Process.

In a plant for the manufacture of cement wherein transportation of the materials is effected by cranes and belt conveyors without the use of screw conveyors and bucket elevators, there are provided a primary crusher (28) for the raw materials, a belt conveyor (30) for carrying the crushed material to a screen (32) from which the reject is passed to a secondary crusher (34), and a second belt conveyor (36) delivering the material from the secondary crusher on to the first



conveyor. The material passing the screen is fed by belt conveyors (38, 40) to a storage bin (42) wherein it is distributed to provide a correct mixture. Further mixing is obtained by delivering portions from different parts of the bin on to a moving conveyor (44) which delivers the product to another conveyor (46) delivering to a bin (48). Other raw materials are dealt with similarly and are finally delivered to bins (50, 52). Coal is crushed in a crusher (12) and is delivered by belts to a bin (20). The materials from the bins are taken by cranes (24, 26) to a tube-mill (58) whence the product passes to a settling-tank (64) and slurry tanks (68). The slurry is supplied to a rotary kiln (72) fired with powdered coal delivered from the bin (20) by the crane (26). The clinker is passed to a cooling grate and then to a conveyor for delivery to a crusher (108) from which the product is taken by the crane (26) to the storage bin (112).—No. 625,832.—J. E. Kennedy. September 1946.

[Publication of British patents by the Patent Office has been delayed due to the war.]

Published by CONCRETE PUBLICATIONS, LTD., 14, Dartmouth Street, London, S.W.1. England.
Printed in Great Britain by CORNWALL PRESS LTD., 1-6, Paris Garden, Stamford Street, London. S.E.1.